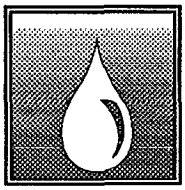
CALFED Vision for Contaminants



The CALFED vision for contaminants is to ensure that all waters of mainstem rivers and tributaries entering the Bay-Delta, and of waters in the Bay-Delta are maintained free of toxic substances in loads and concentrations that compromise ecosystem functions, habitats, biological communities, or species. CALFED will focus on prevention, control, or reduction of high priority contaminants by targeting agricultural and urban point and non-point source controls, remediation of mine wastes, minimizing boat discharges, minimizing dredging effects, flow management, habitat restoration, and watershed management. CALFED recognizes the Delta as a critical resource, necessitating water quality protection for all beneficial use designations including municipal and domestic water supply, irrigation, stock watering, contact and non-contact water recreation, hydroelectric power generation, industrial service supply, warm and cold freshwater habitat, warm and cold water spawning, fish migration, and wildlife habitat.

While CALFED also recognizes that cause and effect relationships between contaminants and the abundance of aquatic resources have not been conclusively documented, CALFED envisions a restored, healthy Bay-Delta ecosystem in which contaminant loads and concentrations are reduced to levels that do not interfere with restoring primary and secondary productivity, nutrient cycling, and food web support functions. CALFED also envisions a restored, healthy Bay-Delta ecosystem in which all human health warnings about consuming fish and wildlife caught in the Bay-Delta are eliminated.

Background

It is estimated that five to forty thousand tons of contaminants enter the Bay-Delta annually. Distribution within the Bay-Delta is governed by complex flow patterns which are highly influenced by riverine inputs and Delta export pumping. Contaminants represent those inorganic, organic, and biological compounds which introduce the risk of adverse physiological response in humans, plants, or fish and wildlife resources through waterborne or food chain exposure. Contaminants may cause acute toxicity and organism mortality, or chronic toxicity and associated detrimental physiological response such as reduced growth or reproductive impairment. While a substantial body of bioassay research exists to confirm that toxicants are affecting lower trophic level resources to varying degrees in the Bay-Delta, ecosystem or population level effects are not well understood. Researchers vary in their opinions about the significance of the role that contaminants have played in the current poor health of the Bay-Delta. Contaminant toxicity has been documented in shellfish, fish, mammal, and bird species from the Bay-Delta. The most serious contaminant problems in the Bay-Delta and its mainstem rivers and tributaries arise from mine drainage, agricultural drainage, and urban runoff.

Inorganics

Inorganic contaminants include heavy metals, phosphates, and nitrates which primarily enter the Bay and Delta Estuary ecosystem from municipal wastewater treatment plants, industrial effluents, agricultural drainage, and urban run-off. Heavy metals in the water column usually occur in trace amounts, however they do not breakdown organically, and additional system inputs allow them to bioaccumulate in plant and animal tissue within food chains to levels that are potentially toxic at

higher trophic levels. Heavy metals of greatest concern within mainstem rivers and tributaries to the Delta Estuary and Bay are cadmium, copper, mercury, selenium, and zinc due to their propensity to bioaccumulate to toxic levels in aquatic environments.

Organics

Organic contaminants include polychlorinated biphenyls (PCBs), plastics, pesticides, fertilizers, solvents, pharmaceuticals, and detergents which primarily enter the system through urban and agricultural runoff. Due to their resistance to decomposition, organic contaminants are persistent in the environment, and many are toxic to living organisms.

Biological

Biological contaminants include bacteria and viruses which enter the system from improperly treated municipal sewage, septic systems, farm and feedlot runoff, recreational boat discharges, and urban runoff. Of particular concern to humans are those bacteria which cause cholera, hepatitis, salmonella, and typhoid.

Identification of Impacted Key Habitats and Ecosystem Processes

Contaminants are widespread and exist to varying degrees in the water column and sediments within all 14 Ecological Zones. Contaminants are suspect, or are known to be adversely effecting sustainability of healthy aquatic food-webs and interdependent fish and wildlife populations. Contaminants could potentially be playing a key role altering the composition of biological resources within impacted aquatic and wetland habitats.

Potential Contaminant Risk within Ecological Zones	
North Sacramento Valley	C
Cottonwood Creek Watershed	B
Colusa Basin	D
Butte Basin	C
Feather River/Sutter Basin	B
American River Basin	C
Yolo Basin	C
Eastside Delta Tributaries	C
East San Joaquin Basin	C
West San Joaquin Basin	D
Sacramento-San Joaquin Delta	D
Suisun Marsh/San Francisco Bay	D
Sacramento River	D
San Joaquin River	D

In the Sacramento Basin, acidic drainage from abandoned mine tailings is a significant source of cadmium, copper, zinc and mercury to tributaries and mainstem rivers which eventually flow into the Delta. Acute toxicity of these trace metals have resulted in fish kills, chronic level effects have resulted in detrimental growth and reproductive impairment. Of immediate concern is the potential hazard associated with mine drainages just upstream of the spawning area for the endangered winter run Chinook Salmon on the Sacramento River. In the Colusa Basin, water quality objective exceedances for mercury, and corresponding episodic toxicity events are the result of drainage from abandoned mine tailings and coast range geologic sources; effects on aquatic biota and wildlife can prevail as flows move into the Delta.

In the San Joaquin Basin, selenium in agricultural drainage resulting from intense irrigation of locally occurring seleniferous soils is a contaminant of concern since chronic toxicities are known to have caused reproductive failure in sensitive fish species, as well as teratogenic effects in waterfowl and shorebirds. Selenium is also prevalent in the San Francisco Bay resulting from oil refinery discharges. Heavy metal loadings, including selenium, into the Bay and Delta Estuary have resulted in increasing

concentrations in benthic invertebrate, fish, and wildlife populations. Compared to reference sites, some contaminants in the Bay and Delta Estuary's water, sediments, and biota, occur at elevated levels.

In the Sacramento and San Joaquin Basins, agricultural chemical runoff from rice fields, agricultural crops, pasture and orchards has introduced contaminants into tributaries and mainstem rivers which ultimately flow in the Delta Estuary and Bay. Organophosphate insecticides such as carbofuran, chlorpyrifos, and diazinon are ubiquitous throughout the Central Valley, and are dispersed in agricultural and urban runoff. Dormant spray pesticides are known to influence riverine inputs in the winter and enter the estuary in concentrations toxic to invertebrates. Although their use has been banned, organochlorine pesticides such as chlordane, DDT, and toxaphene, and organochlorine compounds such as PCBs remain persistent in the environment, and since they are accumulative in biota can be potent toxicants to fish and wildlife; chlorinated pesticides are still being detected in fish and wildlife within the Delta.

Effluent inputs from municipal and industrial sources are ubiquitous on mainstem rivers entering the Delta Estuary and the Bay. Reduction of these inputs is necessary for restoration of native fish and wildlife by reducing chronic and acute effects which alter aquatic food webs or impair reproductive potentials.

Ecosystem Restoration Needs and Opportunities

CALFED recognizes the inherent complexities in defining processes related to toxic substances and biological responses in the Bay-Delta Estuary where processes operate over a wide range of spatial and temporal scales, as well as over a wide range of hydrologic regimes. Initiating the process of ecosystem restoration will be achieved by implementation of the following CALFED actions which focus on contaminants prevention, control, and reduction of sources that represent immediate potential toxicological hazards to ecosystem processes.

Remediation of abandoned mines that contribute significant amounts of heavy metals, sediments, acidified water and other pollutants to tributaries and mainstem rivers which eventually increase loading to the Bay-Delta Estuary. Water degradation from mine drainage can be controlled by controlling runoff based on water quality objectives for specific contaminants, by regrading, sealing, and reclamation of strip-mined lands through restoration of physical habitat, or by use of biological or chemical inhibitors to reduce acid formation.

Agricultural point source and non-point controls of pesticides, herbicides, mineral salts, and trace elements will be achieved through best management practices including improved irrigation and tillage techniques, areal pesticide spray restrictions and integrated pest management to reduce pesticide use and consequent discharge to waterways during rainfall events, improved fertilizer application technologies, altering of residence times, and improved water-use efficiencies. If necessary provide financial incentives for successful implementation of best management practices. The successful regulation and reduction in rice herbicides in the Sacramento River demonstrates that it is not impossible to regulate non-point source contaminants.

Reductions in agricultural point and non-point sources of pesticides, herbicides, mineral salts, and trace elements will be also be achieved through an aggressive program of habitat restoration.

Changes in land uses from agriculture to fresh emergent wetland, seasonal wetland, riparian, oak woodland, and contiguous perennial upland buffers will reduce the concentrations and loads of contaminants associated with current agricultural uses. Modifications of current farming practices in other areas to be more wildlife friendly by changes in cultivation practices, post harvest flooding, and reduced pesticide and herbicide application rates will also support reductions in contaminants that could affect adjacent aquatic resources.

Reduce the concentration of contaminants entering the Bay and Delta Estuary and its tributaries by improving drainwater management which would include drainwater reuse, groundwater management, scheduled releases to the San Joaquin River coinciding with dilution flows or acquiring dilution flows from willing sellers, drainwater evaporation systems, and on-farm bioremediation utilizing flow-through systems. Land retirement with cessation of irrigation could be used on those lands which have soils which are difficult to drain, overlay shallow seleniferous groundwater tables, or have low economic returns.

Reduce urban and industrial contaminants loading to the Bay and Delta Estuary by enforcing existing source control regulations, provide incentives for additional source control, control urban planning and development projects, endorse wastewater reclamation projects which control industrial and municipal effluent discharges.

Monitor dredging activities to reduce the release and resuspension of toxic substances in contaminated sediments and discharge of contaminated water from dewatering operations.

Examine the feasibility of wetlands management as a means of water quality improvement by controlling natural, wastewater, and storm water contaminants. Wetlands have the ability to either retain contaminants or reduce loadings by converting them by biochemical processes to less harmful forms; wetlands also stabilize sediments. Without proper management of contaminants however, wetlands can degrade and subsequently threaten the food chains they support.

Reduce risks of bacterial and viral contamination from domestic wastewater by increased enforcement of boating discharge regulations in the Bay-Delta Estuary and tributaries, curtail recreational over-use and building of recreational homes in close proximity to streams or Delta waterways, and endorse wastewater reclamation projects.

Reduce point and non-point source contaminants by developing or implementing existing watershed management plans which effectively reduce contaminant loadings effecting ecosystem processes. Management practices that reduce loading include reduction of contaminant loading to reservoirs, ground-water protection, erosion control, mine reclamation, land-use planning, animal waste control, and non-point source screening and identification.

Develop water quality and sediment quality objectives for the protection of aquatic life for those contaminants of concern which have none.

Linkage to Other Restoration Programs

Ongoing water quality and contaminants monitoring programs are being administered by the State Water Resources Control Board and its Regional Water Quality Control Boards, the U.S.

Environmental Protection Agency, and the U.S. Geological Survey. Some of these programs have made significant progress in controlling contaminant loading to the Bay-Delta primarily through point source discharge controls of municipal wastewater treatment plants and industrial discharges. Other monitoring programs have identified long term trends in contaminants in ecosystem biota which have helped to guide restoration efforts, while current programs in the Bay-Delta are focusing on toxic effects on ecosystem processes, identifying transport and fate of toxic substances, as well as quantifying ecological response to toxic substances.